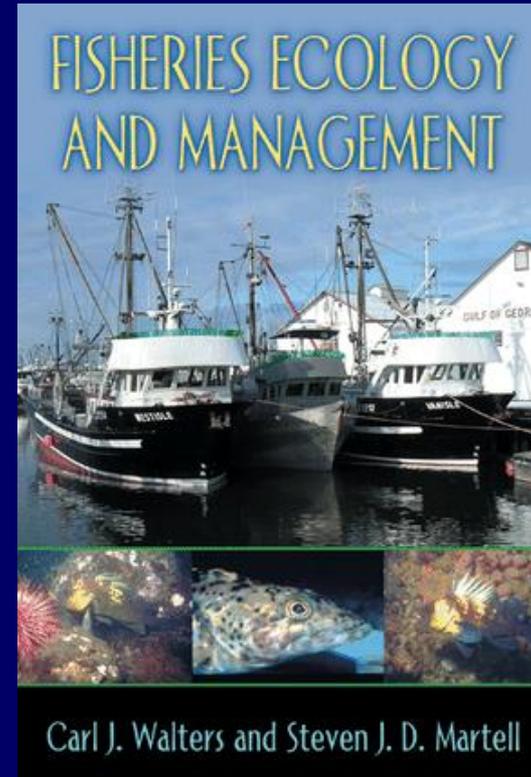
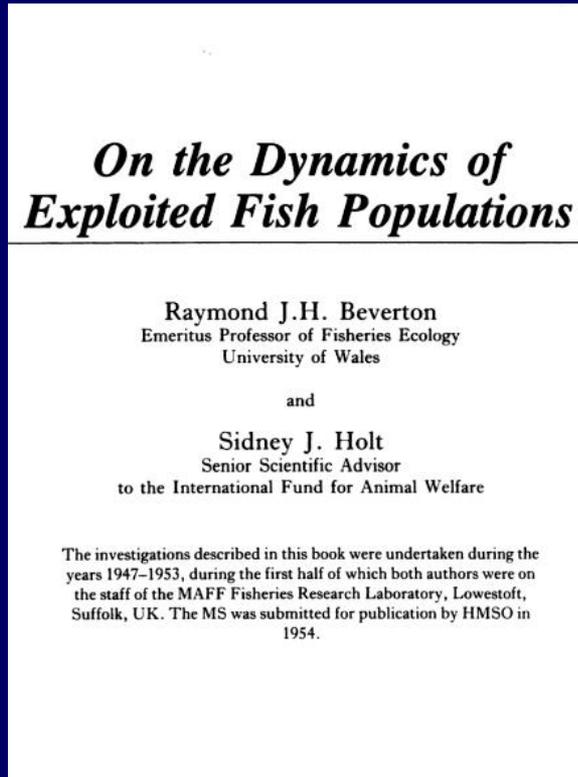


Management Objectives for Salmon and Steelhead



Jim Scott, Special Assistant
Director's Office

Presentation Outline

- Why Set Management Objectives?
- Spawner-Recruit Fundamentals
- 8 Key Points

Why Set Management Objectives?

PACIFIC HALIBUT AND THE THOMPSON-BURKENROAD DEBATE

Pacific halibut is one of the most valuable fisheries in the north Pacific, apparently involving one major stock distributed from Alaska to British Columbia. It has been intensively monitored and managed since the middle of the last century by the International Pacific Halibut Commission (IPHC). It has shown a striking, cyclic pattern in recruitment variation:

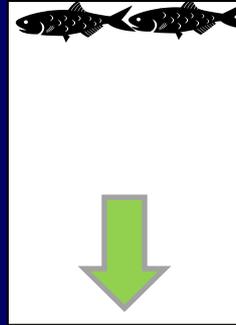


The first decline and recovery of the stock engendered the famous “Thompson-Burkenroad” debate (Skud 1975). R. F. Thompson, first head of the IPHC, maintained that the first monitored decline had been caused by overfishing, and that the first recovery was due to the sound management of harvests. His “enemy” Burkenroad, one of the first oceanographers to think

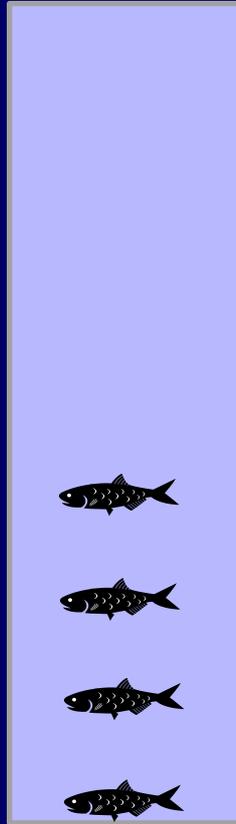
Management objectives are a societal decision to allocate a renewable fisheries resource between present and future use.

Spawner-Recruit Fundamentals

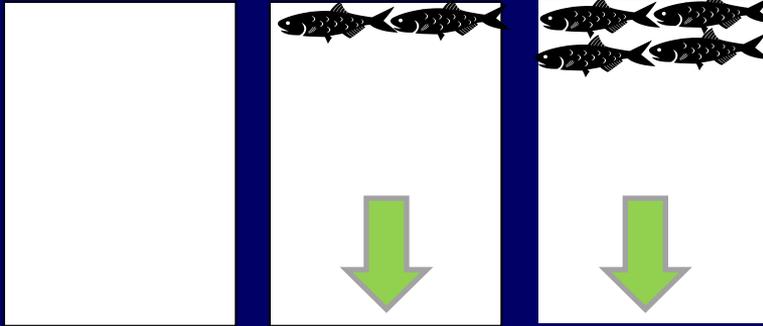
Spawners



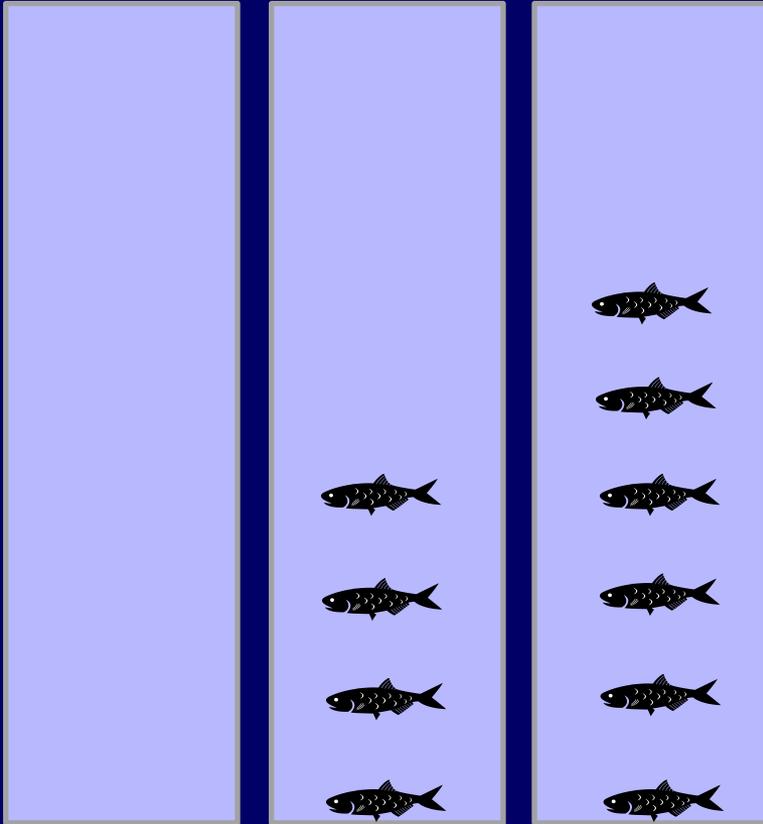
Recruits



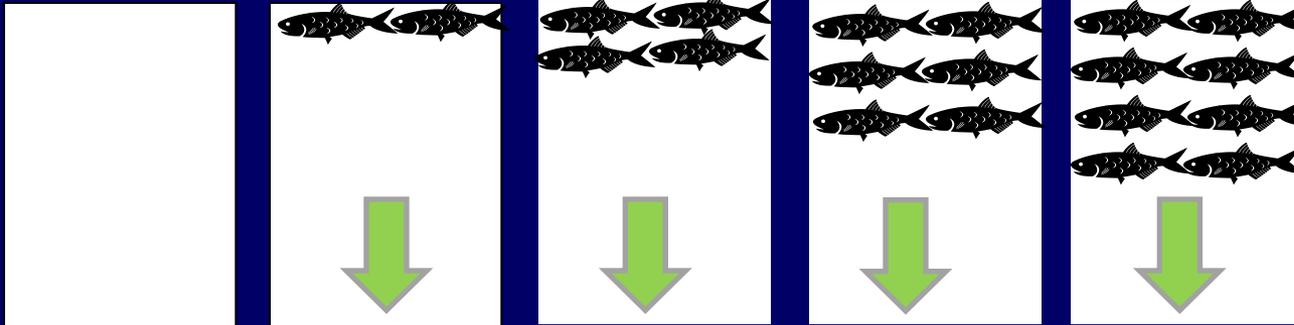
Spawners



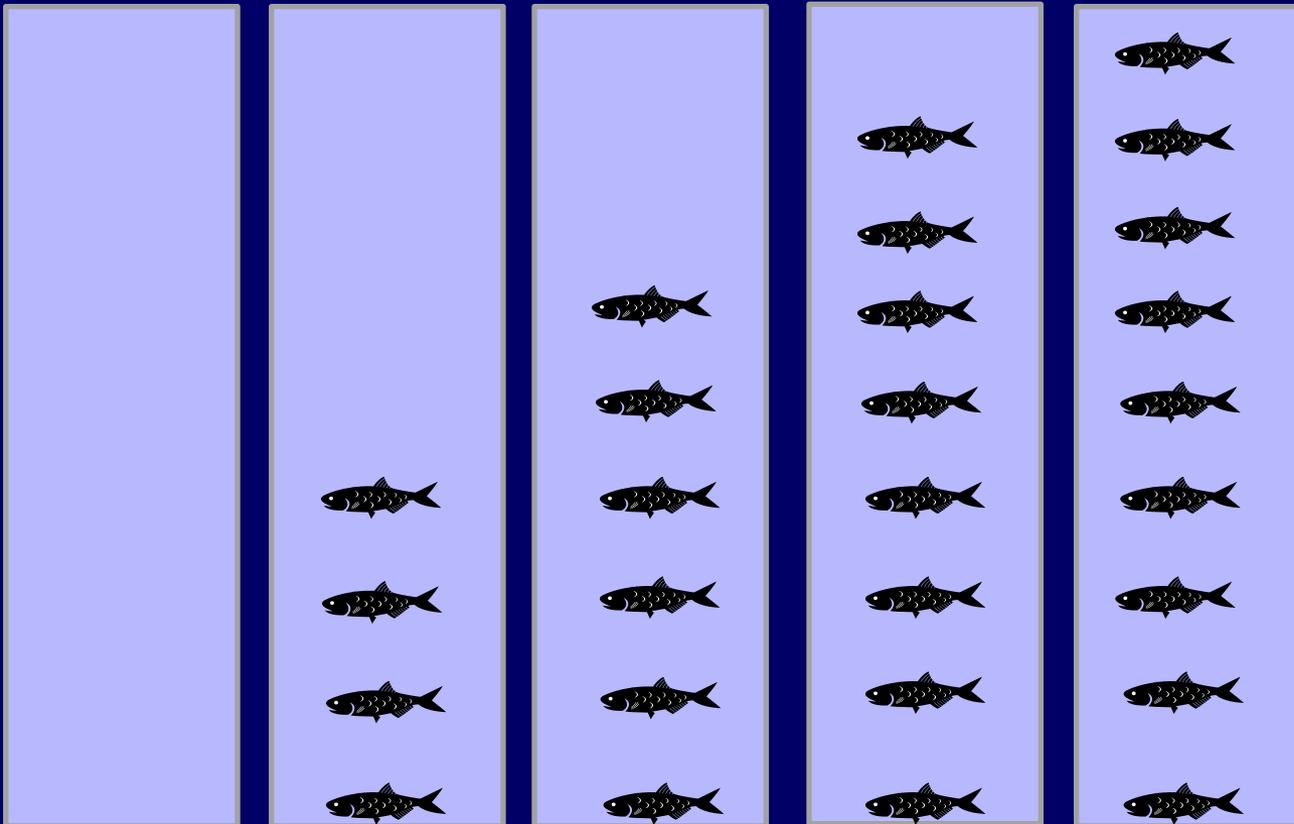
Recruits



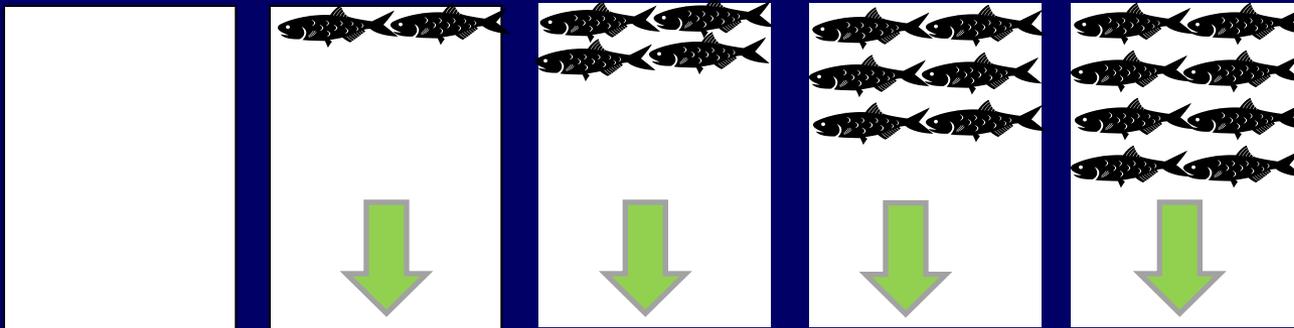
Spawners



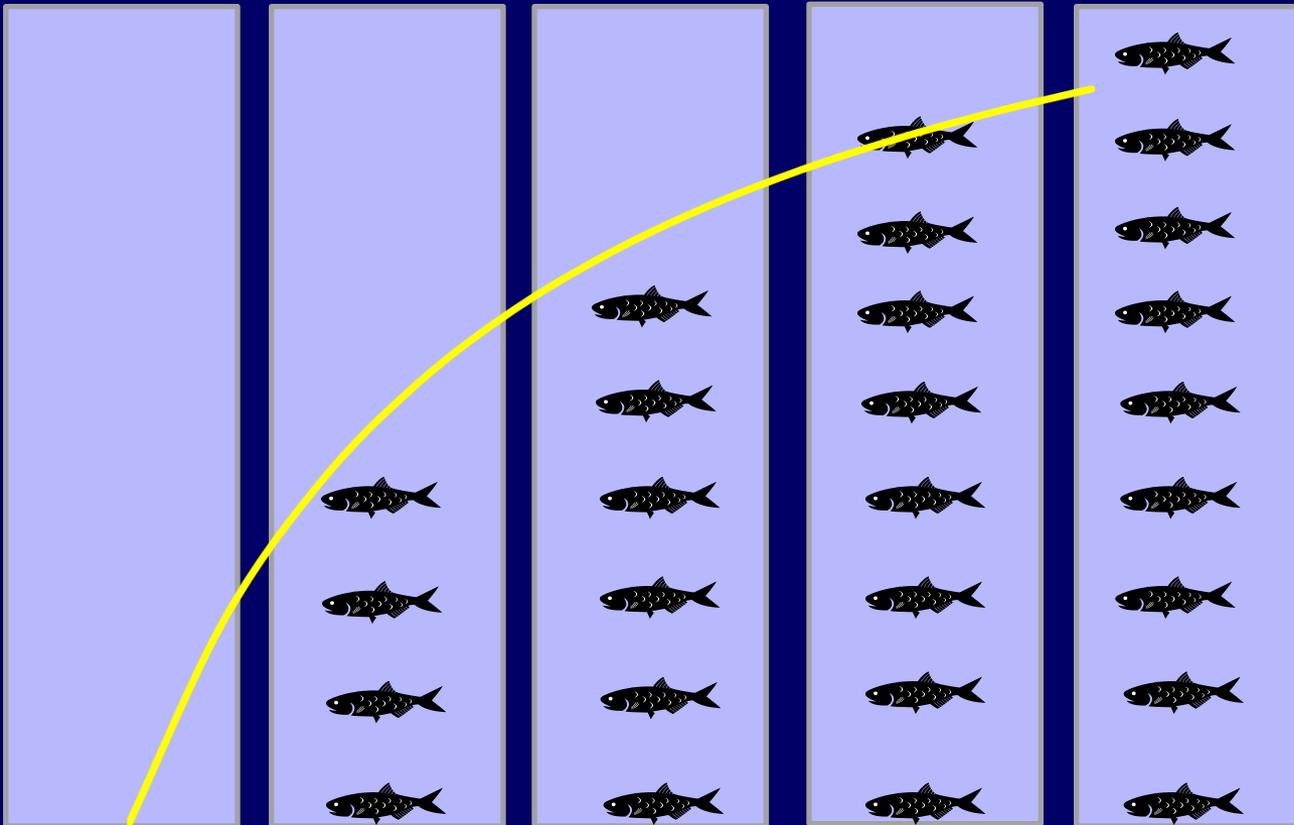
Recruits



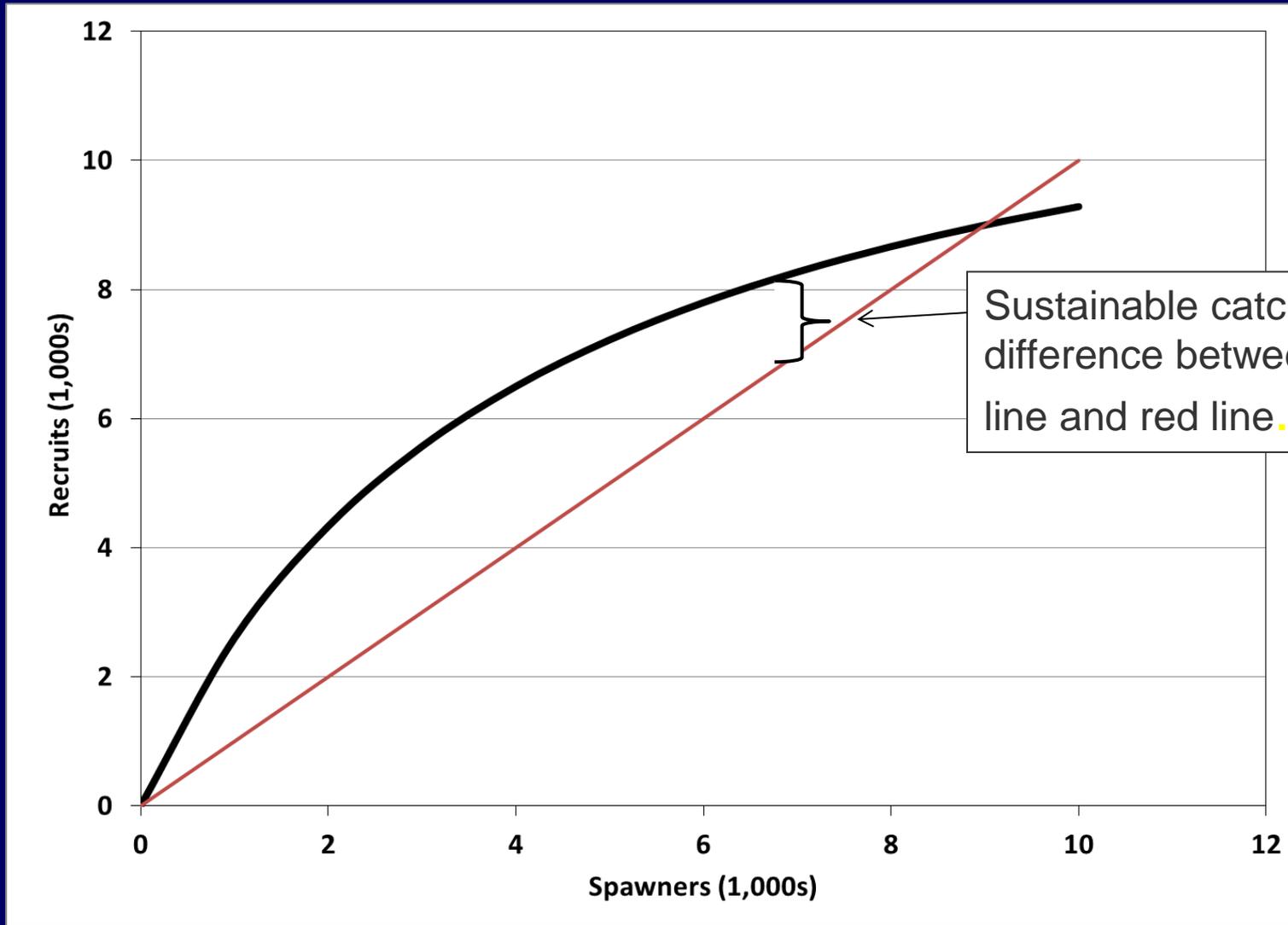
Spawners



Recruits



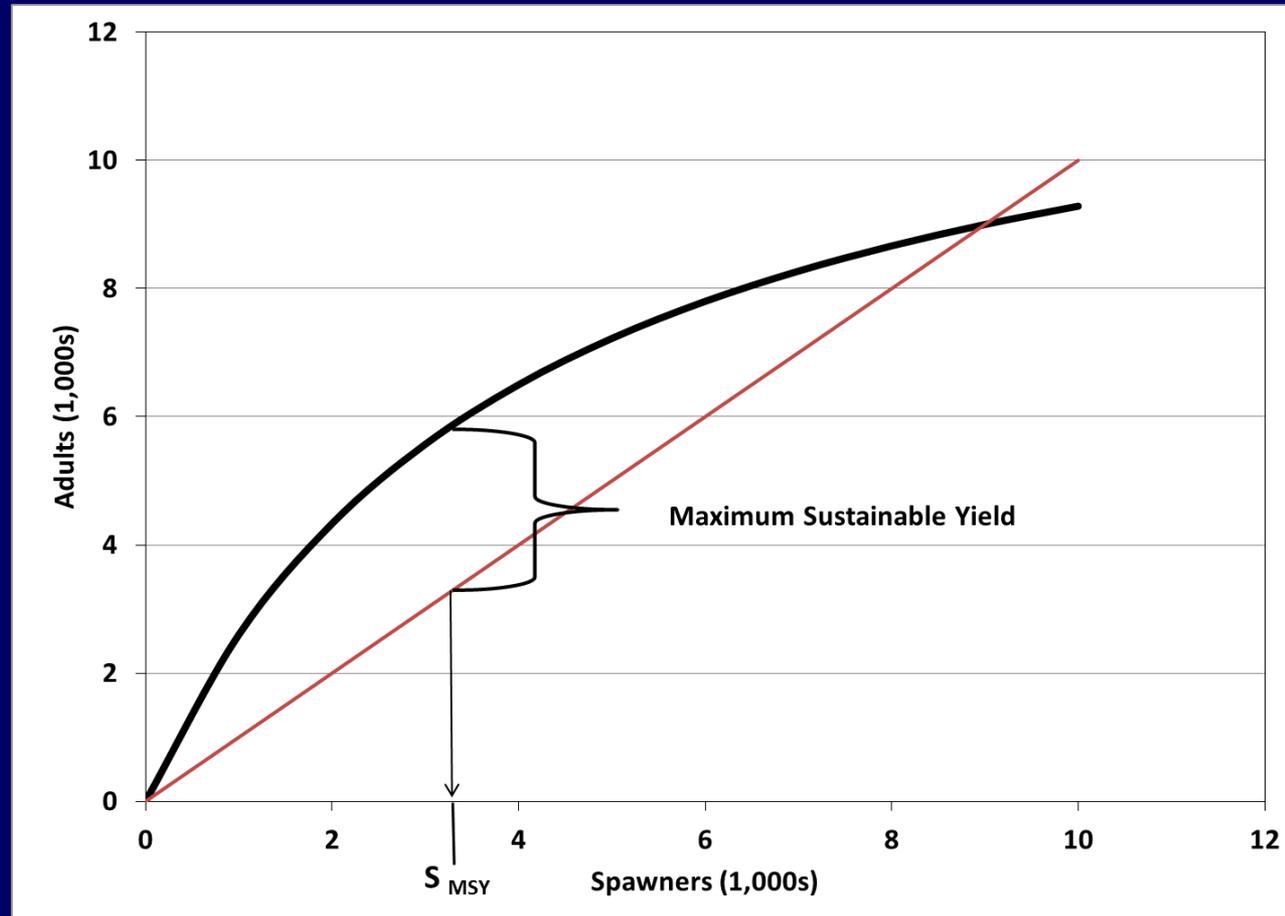
Spawner-Recruit Function



Key Point #1

Maximum Sustainable Yield (MSY) is Common Standard

- Pacific Salmon Treaty
- Magnuson-Stevens Act
- US v. Washington



Key Point #2

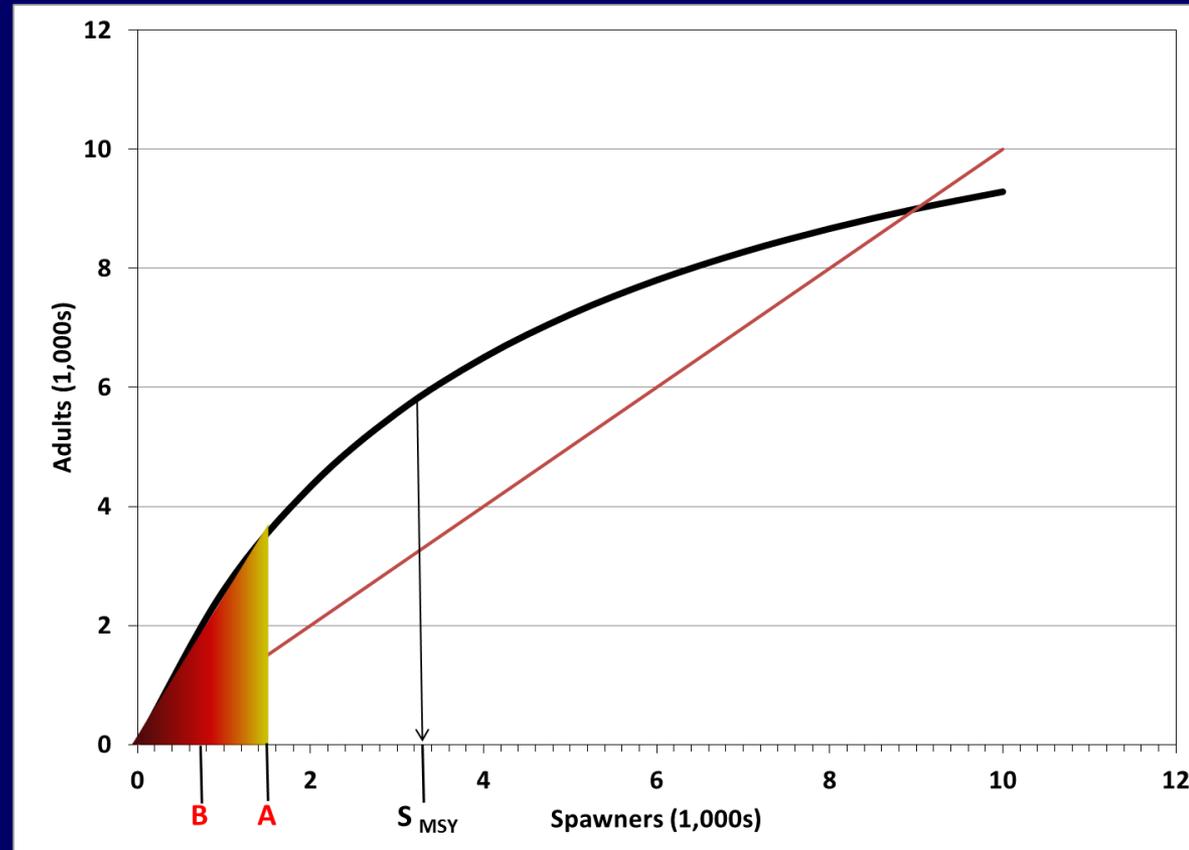
Spawners Below MSY Does Not Imply Extinction Risk

Overfished (3 years)

- Chinook
- < 50% MSY (point A)

High Risk

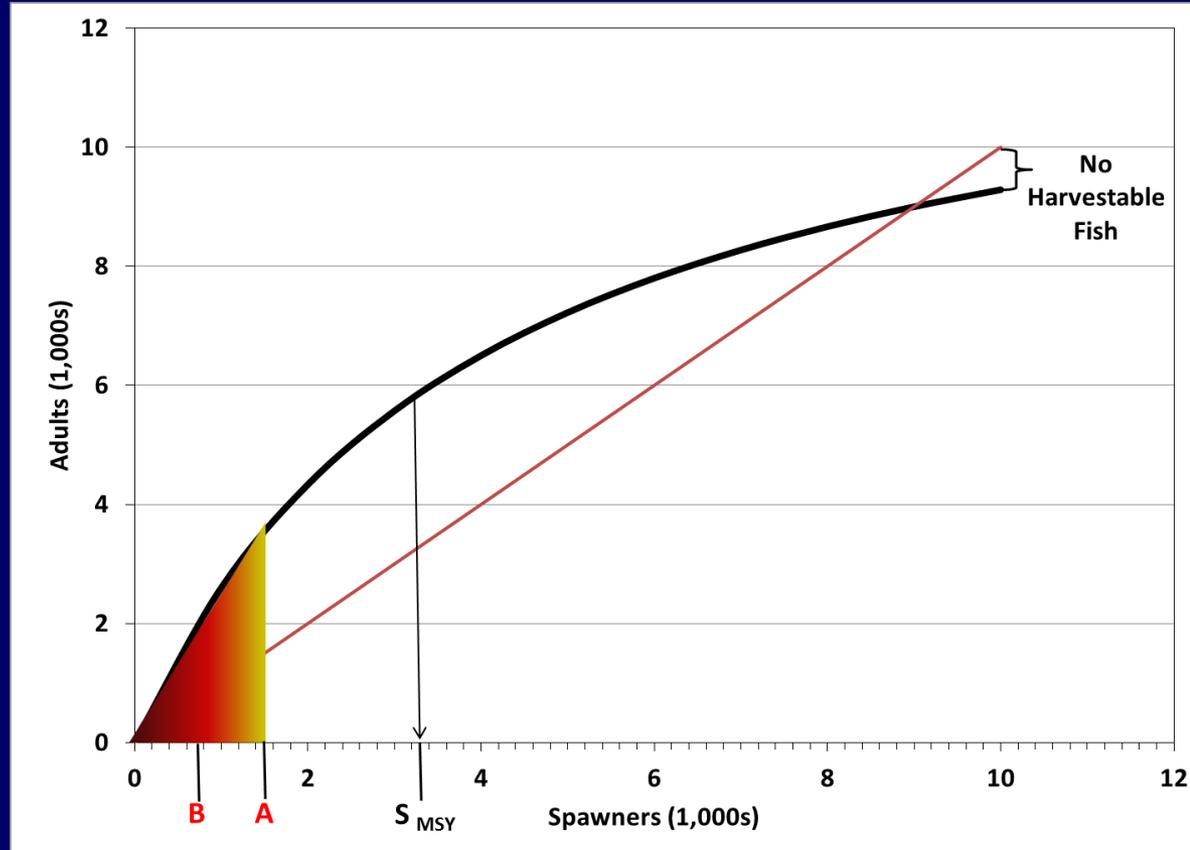
- 5% unfished abundance (point B)



Key Point #3

Objective Rarely to “fill the habitat to capacity”

- Productivity declines as spawner densities increase
- Results in no harvestable fish at very high densities



Key Point #4

MSY Evolved – Broader Considerations & Improved Science

Consideration

- Economic - strict management for spawner goal can create boom-bust cycle

Management Evolution

- ✓ Harvest rate management can achieve similar longterm yield

(e.g., apply 35% harvest rate each year)

Key Point #4

MSY Evolved – Broader Considerations & Improved Science

Consideration

- Additional population characteristics important to sustain populations over longterm

Management Evolution

- ✓ Include diversity and spatial structure as objectives

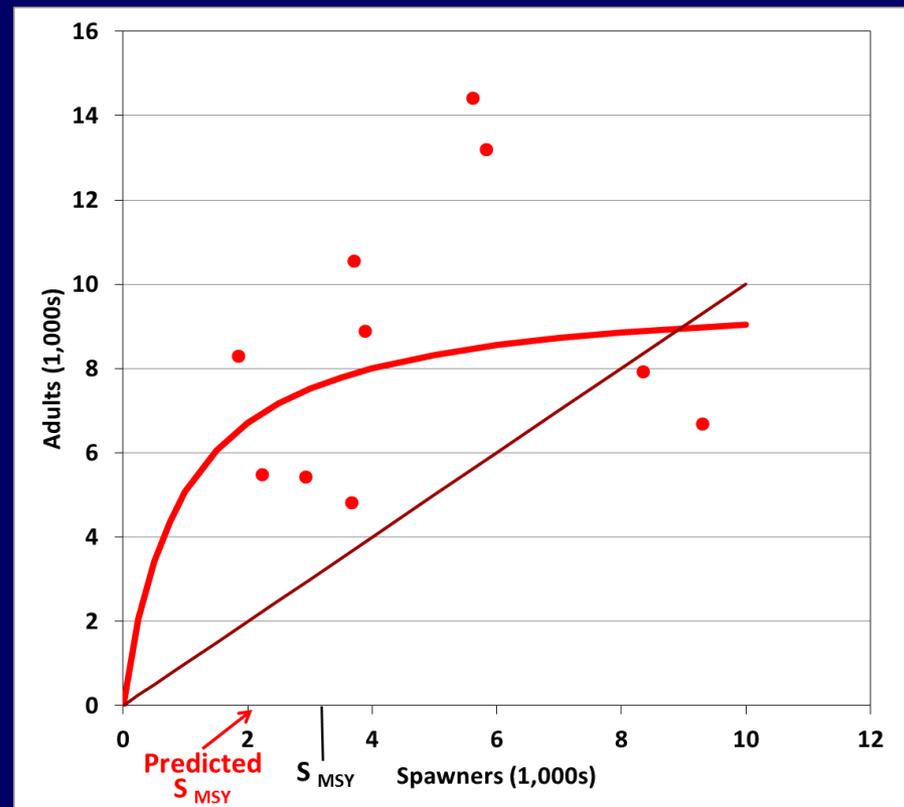
Key Point #4

MSY Evolved – Broader Considerations & Improved Science

Consideration

- Environmental variability and error in estimating spawners make management for MSY difficult and expensive

Management Evolution



Key Point #4

MSY Evolved - Broader Considerations & Improved Science

Consideration

- Environmental variability and error in estimating spawners make management for MSY difficult and expensive

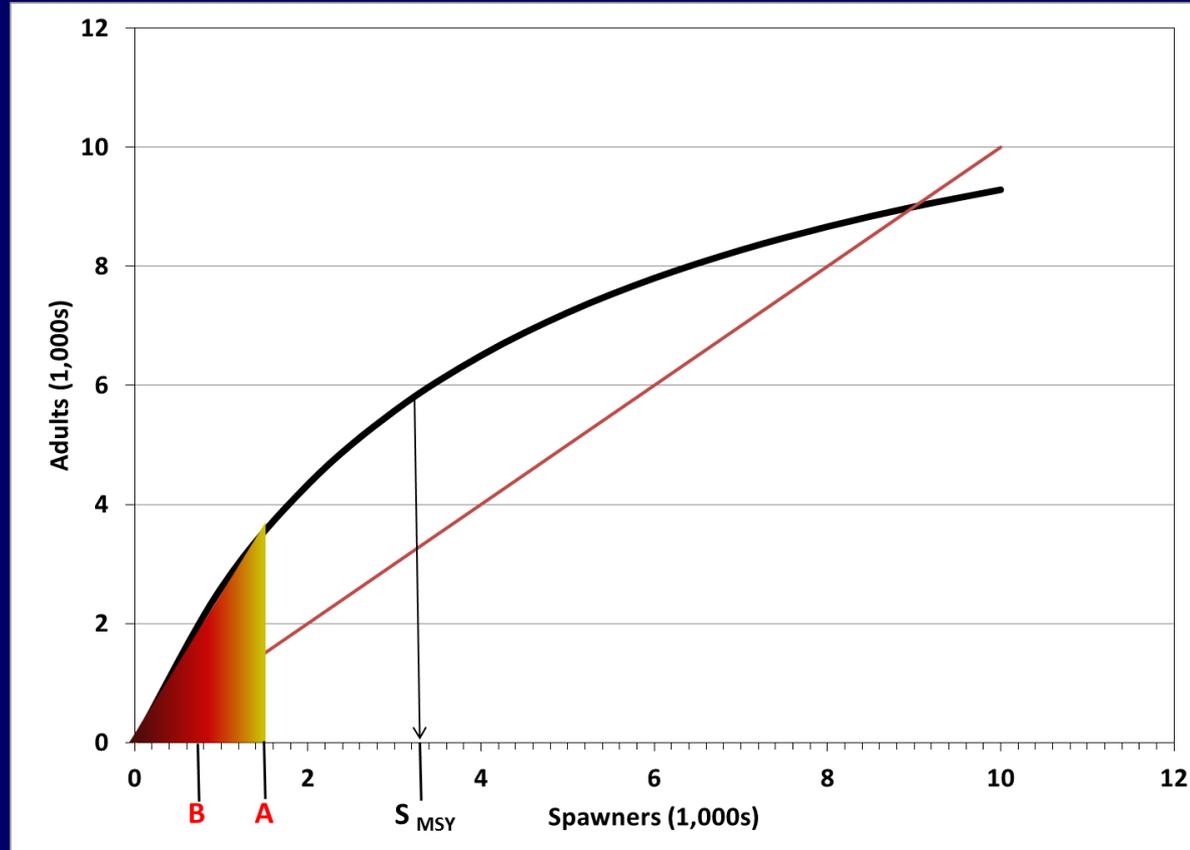
Management Evolution

- ✓ Use “smart” analytical methods
- ✓ Incorporate uncertainty in management
- ✓ Consider harvest rate management

Key Point #5

MSY Not Informative Where Habitat Substantially Degraded

Historical

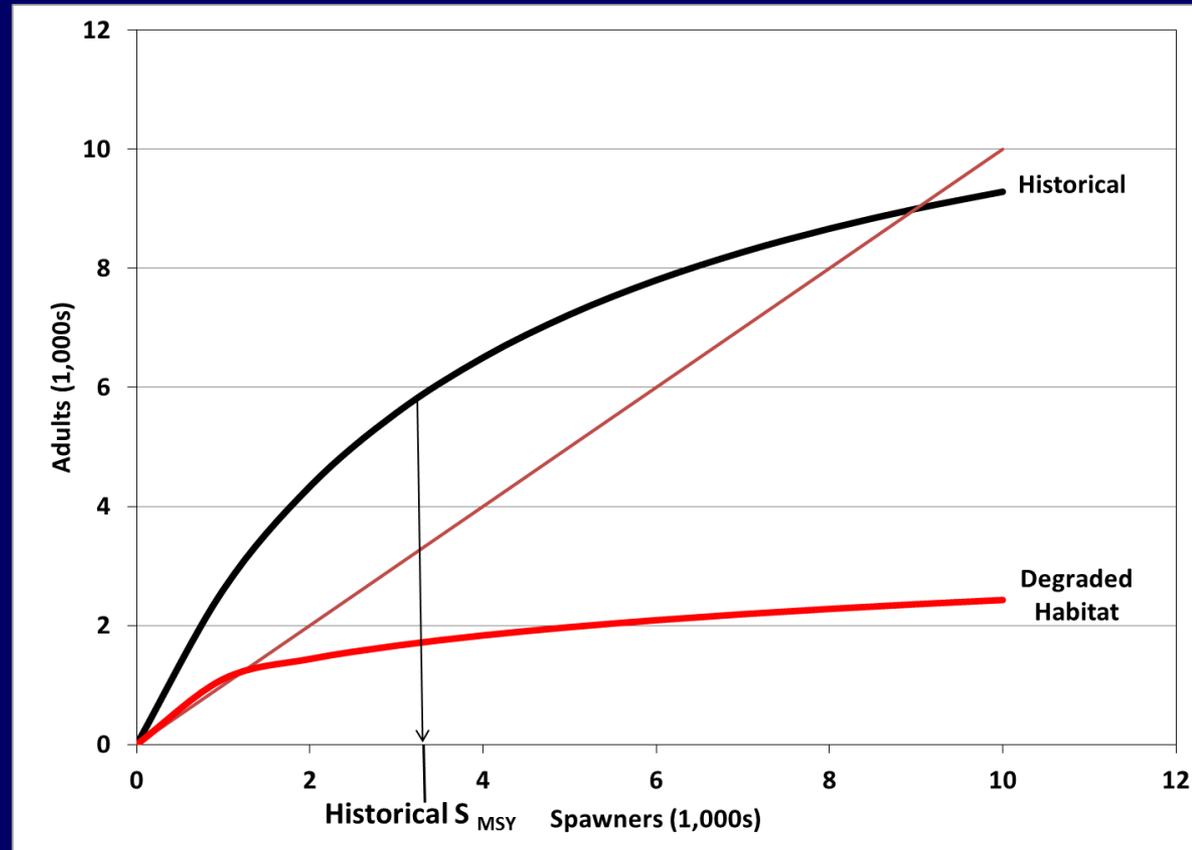


Key Point #5

MSY Not Informative Where Habitat Substantially Degraded

Habitat Degraded

- Lower Capacity: Fewer fish supported
- Lower Productivity: Fewer adults per spawner

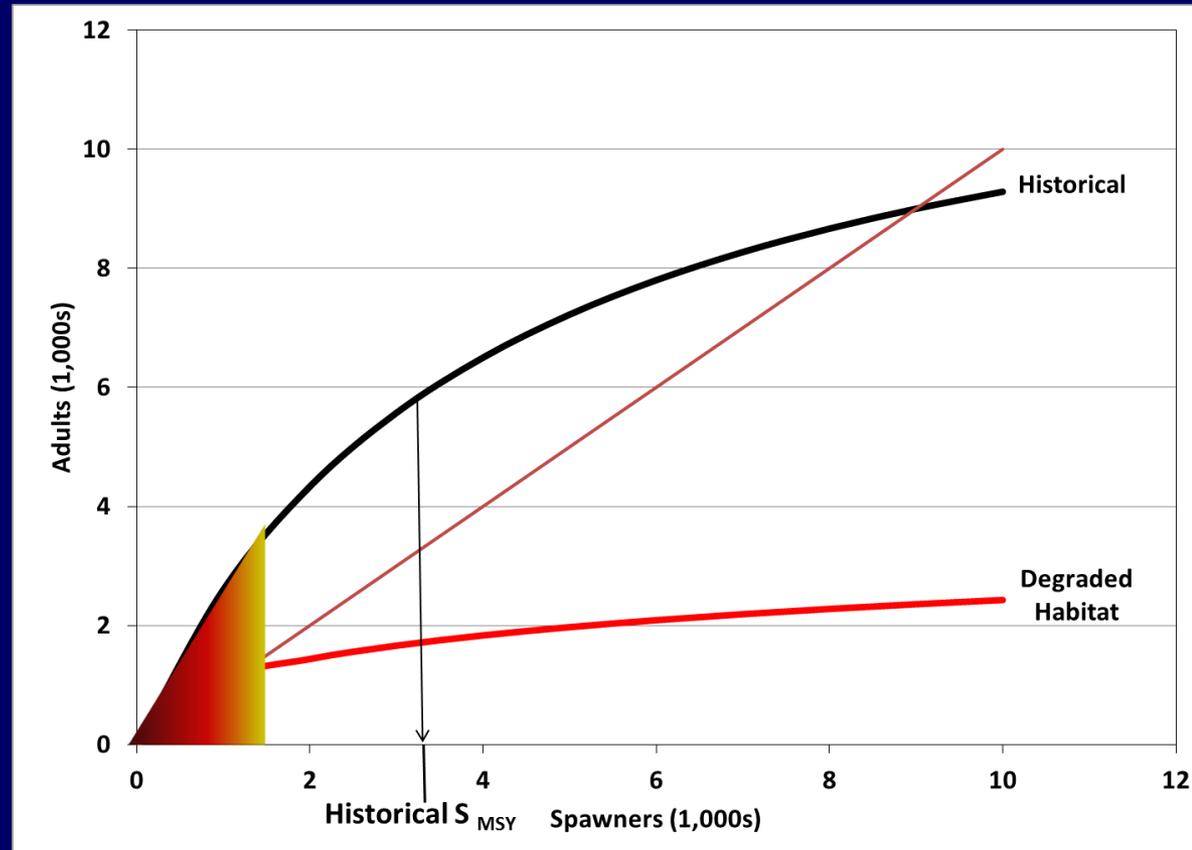


Key Point #5

MSY Not Informative Where Habitat Substantially Degraded

Habitat Greatly Degraded

- Demographic risk drives management



Key Point #6

Multiple Approaches - Technical Analysis Challenging

MSY Spawner or Harvest Rate Management Objectives

- Stock Recruit Analysis (Grays Harbor Chinook)
- Historical Average (Hoko Chinook)
- Habitat (Puget Sound Coho)

Habitat Degradation (ESA-listed)

- Demographic Risk Analysis (Skagit Chinook)
- Historical Average (Puget Sound Steelhead)

Key Point #7

Important to Routinely Update Objectives

Environmental Conditions Not Stationary

- Stock Recruit Analysis
 - ✓ Grays Harbor Chinook (2014)
 - ✓ Willapa Coho (2015)
- Demographic Risk Analysis
 - ✓ Lower Columbia Tule (2011)
 - ✓ Skagit, Stillaguamish, Snohomish Fall Chinook (2000)

Key Point #8

Substantial Work Underway

- **Chinook**
 - ✓ Pacific Salmon Treaty Indicator Stocks (2016-17)
 - ✓ Puget Sound (2016-17)
 - ✓ Willapa Bay (Willapa Policy, 2020)
- **Sockeye**
 - ✓ Cedar River (2016)
- **Chum**
 - ✓ Willapa Bay (Willapa Policy, 2016)
 - ✓ Grays Harbor (Grays Harbor Policy, 2016)
- **Steelhead**
 - ✓ Lower Columbia (2016)
 - ✓ Puget Sound recovery goals (2017)

Summary

Management Objectives - Key Points

- 1) MSY is common standard
- 2) Fewer than MSY spawners - does not imply extinction risk
- 3) “Fill habitat to capacity” - rarely objective
- 4) Objectives evolving - diversity, spatial structure, economics

Summary

Management Objectives - Key Points

- 5) Demographic risk - critical when habitat greatly degraded
- 6) Technical analyses challenging
- 7) Environment not stationary – routine updates necessary
- 8) Substantial work underway